Original Research

The Effect of Adding Nanoparticles to Dental Porcelain on the Fracture Resistance and Bond Strength to Zirconia Core

Abstract:

Background: Porcelain combined with zirconia core substructure has low fracture toughness. Nanoparticles are incorporated into the porcelain to boost its mechanical properties. **Aims:** To evaluate the effect of the incorporation of silver oxide and titanium oxide nanoparticles into porcelain powder on the bond strength of porcelain veneer to zirconia core. The flexural strength of nanoparticles-modified porcelain was also evaluated. **Materials and Methods:** The flexural strength of feldspathic porcelain was measured (according to ISO specifications number 6872) after the incorporation of silver and titanium oxide nanoparticles. For measuring the bond strength at the porcelain-zirconia interface, 70 bars (4 × 4 × 12 mm) of zirconia were cut and fired in a furnace. The control and nanoparticles-modified porcelain powders were built up on the zirconia bars and fired to create veneers of 3 mm height, 4 mm width and 4 mm thickness. The porcelain veneers were de-attached from the zirconia core by the universal testing machine. The failure load was recorded to calculate the bond strength. **Statistical Analysis:** The data were analysed with one-way analysis of variance followed by Tukey's test. **Results:** The addition of 0.5–1.5% silver oxide nanoparticles to feldspathic porcelain increased the flexural strength. The addition of 1.0–4.0% titanium oxide nanoparticles to feldspathic porcelain increased the flexural strength. Either 0.5–1.0% silver oxide or 3.0–4.0% titanium oxide nanoparticles in feldspathic porcelain increased the shear bond strength to zirconia core. **Conclusion:** The flexural strength of porcelain veneer and the bond strength at porcelain-zirconia interface can be improved by adding either 0.5% silver oxide nanoparticles or 4% titanium oxide nanoparticles to porcelain powder.